# Short Communications

*J Raptor Res.* 26(4):257–259


## Increased Parental Care in a Widowed Male Marsh Harrier (*Circus aeruginosus*)

Carmelo Fernández[1]
*Estación Biológica de Doñana (CSIC), Avda. Mª Luisa s/n, Pabellón de Perú, 41013 Sevilla, Spain*

Paz Azkona
*Soc. Estudios Biológicos Ugarra, Tafalla 34, 4º, 31003 Pamplona, Spain*

Pair bonding and distribution of functions is essential to the successful breeding of birds (Trivers 1972). This is especially important in raptors, where food is generally not abundant and its capture requires a considerable hunting effort (Newton 1979). Besides food supply, parental care involves more activity including: protection of chicks from inclement weather and predators, nest maintenance and sanitation, and territorial defense (Johannesson 1975, Newton 1986, Fernández 1992), which require much time and energy and can hardly be carried out by a single parent.

In the spring of 1990, during the study of several nests of Marsh Harriers (*Circus aeruginosus*), we noted the disappearance of one of the breeding females. Hence, we had the opportunity to see to what extent the loss of his mate affected the parental behavior of the widowed male and compare his behavior with that of other neighboring breeding pairs.

### Methods

The study was carried out at the Dos Reinos wetland (Ebro Valley, Spain), where ten monogamous pairs of Marsh Harriers bred in 1990 (Fernández 1990). Two of the nests failed during incubation. The other eight breeding pairs were observed from a hide about 300–500 m from the nests. We recorded separately for each sex the time spent by adults in the nest area (limits of wetland area), food items supplied to nestlings, territorial chases and other aspects of parental care (Fernández 1992). To estimate the breeding stages, chicks were aged according to body development (body mass, tarsus length and 6th primary length; Altenburg et al. 1987, González 1991).

During our study we observed the disappearance, for unknown reasons, of the hen in one pair. The disappearance occurred on 20 June 1990 when the chicks were 37–38 d old. A week before, two chicks had been observed in the nest but whether the loss of one young was caused by the female's disappearance or happened previously is not certain. The chick that survived flew when 43 d old, within the usual range of first flight times in the Marsh Harrier (Cramp and Simmons 1980).

The behavior of the male before female loss had been studied over 4 d for 28 hr. Following the disappearance of the female, the behavior of its mate was monitored for 3 d (a total of 22 hr), until the only surviving chick flew. Three aspects of the behavior of the widowed male (percent time spent in nest area, number of food items delivered per hour and number of territorial chases per hour) were compared to those of neighboring pairs over the same breeding period. Observations of neighboring pairs occurred on 20 d (120 hr) before loss and on 16 d (108 hr) during the last days before flying. Statistical comparisons between hours with and without chases and prey delivered were made by means of $\chi^2$-tests in 2 × 2 contingency tables (Sokal and Rohlf 1969).

### Results

As shown in Table 1, the input of parental care by the widowed male before the loss of his mate was similar to input of other males. He spent only slightly more time in nest area than neighboring males ($\chi^2 = 1.07$, $P > 0.05$), delivered a few less food items to nestlings ($\chi^2 = 1.39$, $P > 0.05$) and defended his nesting area as much as other males ($\chi^2 = 0.03$, $P > 0.05$).

After female loss (Table 1) the widowed male: a) spent significantly more time in the nesting area than neighboring males in the same nestling period ($\chi^2 = 103.02$, $P < 0.001$) and about the same proportion of the time as females, b) supplied slightly more food items per hour than mated males ($\chi^2 = 1.75$, $P > 0.05$) though significantly fewer than males and females together ($\chi^2 = 3.91$, $P < 0.05$), and c) defended his nesting area more frequently than other males ($\chi^2 = 6.20$, $P < 0.05$) though not more frequently than mated birds taken together. The number of chases in relation to time spent in nesting area was, however, similar for the single male (1.34 chases/hr) and other male birds (1.58 chases/hr).

[1] Present address: Soc. Est. Biológicos Ugarra, c/Tafalla 34, 4º, 31003 Pamplona, Spain.

Table 1. Comparison of parental care of a widowed male Marsh Harrier with neighboring paired males, before and after female loss in the Ebro Valley, Spain.

| | Before Loss | | After Female Loss | | |
|---|---|---|---|---|---|
| | Widowed Male | Paired Males | Widowed Male | Paired Males | Male and Female Combined |
| Observation time (hr) | 28 | 120 | 22 | 108 | 108 |
| % time in nest area | 22.5 | 14.5 | 33.9 | 12.6 | 36.4 |
| Food items/hr | 0.39 | 0.51 | 0.64 | 0.48 | 0.82 |
| Defense chases/hr | 0.25 | 0.27 | 0.46 | 0.20 | 0.51 |

## Discussion

Disappearance of one of the parents during breeding is not uncommon among birds of prey (Newton 1979). In most cases, if the lost mate is not rapidly replaced, abandonment of the nest results (Newton 1976). Occasionally, however, especially if the death of a parent occurs toward the end of the nestling period (Newton 1986), the remaining adult can successfully rear young. Such has been reported previously for several raptors, including Marsh Harrier (Cramp and Simmons 1980). Successful single-parent broods must likely involve a greater parental effort (Trivers 1972) by the remaining bird or a reduction in number or quality of fledglings. Our observations indicate that the male Marsh Harrier widowed at the late nestling stage of the breeding season made a greater parental effort than mated males, at least in several facets of parental care. He spent more time in the nesting area, delivered a few more (although not significantly more) food items to nest, and carried out more territorial defenses. The increase in number of chases was probably related to the greater amount of time spent in the nesting area. Sasvari (1990) has found experimentally that in the Great Tit (*Parus major*) widowed birds fed nestlings more frequently than either of the mated parents but less than both together, as was also the case with the Marsh Harrier we studied.

Our results suggest that male harriers are not necessarily at the limit of their parental care capabilities during the later stages of nesting. In this sense, Altenburg et al. (1982) found that monogamous birds reduced their parental input, in terms of number of prey items delivered per hour, toward the end of the nestling stage, perhaps indicating that mated males' parental abilities are also "underused" at this time.

A division of sexual roles is usual among birds of prey (Newton 1979) and the presence of both sexes seems essential to successful breeding. However, this division in function becomes blurred in the later stages of reproduction (Newton 1986). As breeding progresses the females contribute gradually more to prey capture and less to other aspects of brood care; sexual roles become similar and can perhaps be undertaken equally by either member of the pair. Role division itself does not necessarily preclude the rearing of nestlings by a single parent, at least in circumstances where the remaining parent is able to increase its investment, as may occasionally occur in some potentially polygynous birds of prey (such as *Circus*; Newton 1976, Cramp and Simmons 1980) when they are breeding monogamously (Altenburg et al. 1982).

Resumen.—El macho de un pareja de Aguiluchos lagunero quedó viudo cuando los pollos contaban con 37–38 días de edad. El macho consiguió sacar adelante un pollo intensificando el esfuerzo reproductor y supliendo en parte las funciones realizadas por la hembra: aumentó el número de cebas, el tiempo invertido en el área de cría y las defensas del territorio. Ello parece indicar que al final de la cría los aguiluchos monógamos con polladas escasas no se encuentran al límite de sus posibilidades y que la contribución relativa de cada sexo a los cuidados parentales es susceptible de variar en función de las necesidades familiares de cada momento.

## Acknowledgments

This research was supported by an FPI grant from the Departamento de Educación and the Dirección de Medio Ambiente del Gobierno de Navarra in collaboration with the Estación Biológica de Doñana (CSIC). We are most grateful to J. Bielefeldt, J.A. Donázar, F. Hiraldo, M. Marquiss, D.T. Parkin and W.C. Scharf for their constructive comments on an earlier draft. The English translation was made by N.C.B. Bowles.

## Literature Cited

Altenburg, W., J. Bruinenberg, P. Wildschut and M. Zijlstra. 1987. Colonization of a new area by the Marsh Harrier. *Ardea* 75:213–220.

———, S. Daan, J. Starkenburg and M. Zijlstra. 1982. Polygamy in the Marsh Harrier *Circus aeruginosus*: individual variation in hunting performance and number of mates. *Behaviour* 79:272–312.

Cramp, S. and E. Simmons. 1980. Handbook of the birds of Europe, the Middle East and North Africa. Vol. II. Oxford University Press, Oxford, U.K.

Fernández, C. 1990. Censo, fenología y éxito reproductor del Aguilucho lagunero, *Circus aeruginosus,* en Navarra. *Munibe* 41:89–93.

———. 1992. Nest material supplies in the Marsh Harrier *Circus aeruginosus*: sexual roles, daily and seasonal activity patterns and rainfall influence. *Ardea* 80. 281–284.

GONZÁLEZ, J.L. 1991. El Aguilucho lagunero *Circus aeruginosus* en España: situación, biología de la reproducción, alimentación y conservación. Ed. ICONA, Madrid, Spain.

JOHANNESSON, H. 1975. Activities of breeding Marsh Harriers *Circus aeruginosus*. *Vår Fågelvärld* 34:197–206.

NEWTON, I. 1976. Population limitation in diurnal raptors. *Can. Field-Nat.* 90:274–300.

———. 1979. Population ecology of raptors. T. and A.D. Poyser, Berkhamsted, U.K.

———. 1986. The Sparrowhawk. T. and A.D. Poyser, Berkhamsted, U.K.

SASVARI, L. 1990. Feeding response of mated and widowed bird parents to fledglings: an experimental study *Ornis Scand.* 21:287–292.

SOKAL, R.R. AND F.J. ROHLF. 1969. Biometry. Freeman and Co., San Francisco, CA.

TRIVERS, R.L. 1972. Parental investment and sexual selection. Pages 136–179 *in* B. Campbell [ED.], Sexual selection and the descent of man. Aldine Press, Chicago, IL.

Received 26 March 1992; accepted 20 August 1992

*J. Raptor Res.* 26(4):259–260


## BATS AS PREY OF STYGIAN OWLS IN SOUTHEASTERN BRAZIL

JOSÉ C. MOTTA JUNIOR
*Departamento de Ecologia e Biologia Evolutiva, Universidade Federal de São Carlos, 13560 São Carlos, SP, Brazil*

VALDIR A. TADDEI
*Departamento de Zoologia, Universidade Estadual Paulista, Instituto de Biociências, Letras e Ciências Exatas, 15055 São José do Rio Preto, SP, Brazil*

Few studies have examined quantitatively large numbers of pellets or stomachs for assessing the relative frequency of bats as prey of owls (cf., Uttendörfer 1943, Ruprecht 1979, Mikkola 1983). Pellets cast by three or four Stygian Owls (*Asio stygius*) were collected during 25 mo, mostly between June 1985 and February 1987 and sporadically in August–September 1989, December 1990 and February 1991. We collected pellets under trees in a *Pinus* sp. plantation located in São Carlos, São Paulo State, southeastern Brazil (21°58′S, 47°52′W) at an altitude of 840 m. The climate of the study area is a transition between Köppen's Cwai and Awi, or rainy tropical with dry (April to September) and wet (October to March) seasons (Tolentino 1967). The nocturnal foraging activities of the owls took place in savannah ("campo cerrado") and grassland ("campo") habitats near the *Pinus* plantation, which was used for diurnal roosting. All data were gathered through direct observation in the study area.

A total of 422 pellets were analyzed after treatment with a 3% boiling solution of NaOH (Schueler 1972). Prey remains were identified by comparison with reference collections. The bulk of the prey items consisted of small birds (Table 1), mostly finches (e.g., *Volatinia jacarina* which alone comprised 62.5% of all birds or 56.3% of all prey), weighing 10–15 g (J.C. Motta Junior unpubl.). Bats were the second most frequent prey whereas insects

Table 1. Numbers of prey items found in pellets of Stygian Owls in two climatic seasons in southeastern Brazil.

| | DRY SEASON | | WET SEASON | | TOTAL | |
|---|---|---|---|---|---|---|
| PREY | *N* | (%) | *N* | (%) | *N* | (%) |
| Bats | 49 | (5.7) | 26 | (6.8) | 75 | (6.1) |
| Birds | 793 | (93.1) | 318 | (83.7) | 1111 | (90.2) |
| Frogs | 0 | | 1 | (0.3) | 1 | (0.1) |
| Insects | 10 | (1.2) | 35 | (9.2) | 45 | (3.6) |
| **Total Prey** | 852 | (100.0) | 380 | (100.0) | 1232 | (100.0) |
| **Total Pellets** | 265 | | 157 | | 422 | |